REMARKS

Claims 1, 3-16, 19 and 20 are pending.

Claims 1, 3-7, 9, 10, 16 and 19-20 are rejected under 35 U.S.C. §102 (b) as anticipated by or, in the alternative, under 103 (a) as obvious over Hansen et al. US 5,589,256, the '256 reference.

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Hansen et al. ('256) in view of Smith et al. U.S. 2002/0090511.

Claims 11-15 are rejected under 35 USC § 103(a) as unpatentable over Hansen et al. ('256) in view of Hansen et al. US 5,789,326, the '326 reference.

Claims 1, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over (renumbered) claims 1-9 and 11-12 in copending Application No. 10/748977.

Claims 1, 5-8, 10-12 and 16 are provisionally rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-8 of copending Application No. 10/815206.

Claims 1, 3-8, 10, and 12-16 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-14 of copending Application No. 10/748969.

Amendments to the Claims

Claim 1 has been amended to cite the crosslinking agent is a polycarboxylic acid. Support for this is found on page 2 of the specification, lines 18 – 28 and includes, among others, citric acid and malic acid. The claim has also been amended to state that the Whiteness Index of the intrafiber crosslinked fibers is measured after curing at from about 182°C to about 215°C. support is found on page 15, Table 3. The specification indicates that fibers can be cured at from 120°C to about 215°C, page 9, lines 19 - 21 and specific examples of curing are given in Table 3, page 15, at 182°C (360°F) and 193°C (380°F).

Claim 5 has been amended to insert "polycarboxylic acid" before "crosslinking agent" and make the claim more definite.

Claim 6 has been amended to replace "a" with "α" to correct a typo error.

Claim 20 has been amended to correct "g/cc" to "cc/g" which was in the application as filed.

The Rejection Of Claims 1, 3-7, 9, 10 and 16 and 19 - 20 Under 35 U.S.C. 102 (b)

Applicants submit the Examiner has not established a *prima facie* case of anticipation. A prima facie case of anticipation requires the presence of a single prior art reference disclosure of each and every element of the claimed invention arranged as in the claims.

Hansen et al. in the '256 reference do not disclose cellulose fibers reacted with an effective amount of of a crosslinking agent in the presence of from about 1% to about 10% of the weight of cellulose fiber of a C_4-C_{12} polyol, the Whiteness Index, $WI_{(CDM\text{-}L)}$ greater than about 69.0, and an L value greater than about 94.5. Furthermore, the reference does not show that the Whiteness Index is measured after curing at a temperature of from about 182°C to about 215°C. Because Hansen et al. do not disclose all the elements of the claim as arranged in the claim, the Examiner has not established a *prima facie* case of anticipation. Withdrawal of the rejection is respectfully requested.

The Rejection Of Claims 1, 3-7, 9, 10 and 16 Under 35 U.S.C. 103 (a)

For a *prima facie* rejection, there must be a suggestion, teaching or motivation, either in the references or in the knowledge generally available to modify a reference, there must be a reasonable expectation of success, and all the claim limitations must be taught or suggested in the prior art. Furthermore, the instant invention shows unexpected results and teaches away from the Hansen et al. reference.

There is no motivation or suggestion in the Hansen et al. '256 reference to arrive at the instant invention and all elements of the claim are not cited. Hansen et al. teach away from using curing temperatures greater than 180°C. Furthermore the results of crosslinking of a polycarboxylic acid in the presence of a polyol and measuring the Whiteness Index after curing at from about 182°C to about 215°C give unexpected synergistic Whiteness Index results.

The '256 patent indicates that high bulk fibers with intrafiber crosslinks (i.e. covalent bonds) can be used in the invention, column 37, line 22-25. These crosslinked

fibers are individual fibers each comprised of multiple cellulose molecules where at least a portion of the hydroxyl groups on the cellulose molecule have been *covalently* bonded to hydroxyl groups on neighboring cellulose molecules in the same fiber by crosslinking reactions with crosslinking agents, column 38, line 54 – line 60. The reference teaches however, that in the preparation of these fibers, the curing stage temperatures of 140 °C to about 180 °C are used which is sufficient to effect curing of the crosslinking agent *without scorching* the dry fibers, column 40 line 63 - 66. The reference teaches that the dried and cured fibers *are not discolored* from *scorching* and the like, column 41, line 7-10. Thus the reference teaches away from curing at higher curing temperatures which would result in scorched and discolored fibers.

In view of the teaching of Hansen et al. relative to the adverse effect of high curing temperatures on color, Applicants submit here is no suggestion or motivation to look to the reference to arrive at the instant invention. In fact, the '256 patent teaches away from the 182 °C to about 215 °C curing range shown in the instant invention since scorching would result in discolored fibers. Thus a person skilled in the art would be discouraged from curing at temperatures greater than 180 °C in view of the adverse effect of the higher curing temperatures resulting in scorching and discoloration of the fibers.

Furthermore, Applicants submit that curing the crosslinking agent in the presence of a polyol at 182 °C to about 215 °C gives unexpected synergistic Whiteness Index results. The Examiner is requested to again review the Declaration of Angel Stoyanov submitted on October 9, 2006. Pulp has a Whiteness Index of 78.16 (Sample A). When pulp is treated with a catalyst, the Whiteness Index is 77.87 (Sample B). When pulp is treated with a catalyst and sorbitol, the Whiteness Index is 77.37 (Sample H). When pulp is treated with citric acid and a catalyst, the Whiteness Index *decreases to 68.69* (Sample C). However, when pulp is treated with citric acid and a catalyst in the presence of sorbitol, the Whiteness Index *increases to 78.71* (Sample D). Thus whereas citric acid has an adverse effect on the Whiteness Index decreasing it from 77.87 (Sample B) to 68.69 (Sample C), when citric acid crosslinking of the fiber occurs in the presence of sorbitol, the Whiteness Index unexpectedly increases to 78.71 (Sample D) indicating an unexpected synergistic response by the addition of the sorbitol. The Whiteness Index measurements resulting from crosslinking cellulose in the presence of sorbitol, a polyol,

at 182°C (360 °F) and 193°C (380 °F) are shown in Table 3 of the instant application show this unexpected synergistic effect.

Similar results are also realized when crosslinking cellulose fibers with citric acid in the presence of xylitol. When pulp is treated with a catalyst and xylitol, the Whiteness Index is 75.50 (Sample J). When pulp is treated with citric acid and a catalyst, the Whiteness Index *decreases to 68.69* (Sample C). However, when pulp is treated with citric acid and a catalyst in the presence of xylitol, the Whiteness Index *increases to 78.5* (Sample F). Thus whereas citric acid has an adverse effect on the Whiteness Index decreasing it from 77.87 (Sample B) to 68.69 (Sample C), when citric acid crosslinking of the cellulose fiber occurs in the presence of xylitol, the Whiteness Index unexpectedly increases to 78.50 (Sample F) indicating a synergistic response by the addition of the xylitol.

The Examiner states the binders are present in an amount from about 3 to 80 percent and that the amount of binder in the Hansen et al. reference presently significantly overlaps the claimed amount. The Applicant assumes this refers to the claimed amount of a C_4- C_{12} polyol. Hansen et al. teach this in a preferred embodiment of an absorbent product comprising a fibrous cellulose mat that contains superabsorbent hydrogel particles in particulate form, column 4, line 41 – 43. Thus the reference relates only to the use of non crosslinked fibers. Furthermore, while there is some overlap between the addition level of the binder and the polyol, the reference does not teach the Whiteness Index value, the L value, the a or b value of the fibers and the fact that the Whiteness Index is measured after curing the fibers at a temperature of 182 °C to about 215 °C.

The Examiner cites column 42, lines 31-34 which states that binders can be added before, after or simultaneously with curing. Where the binders can also function as an interfiber (sic) crosslinking agent the fibers should contain at least 20 % by weight of water which inhibits ester bond formation and ensures that adequate binder will remain in the fibers to bind particles to the fibers. The Examiner then states that in some embodiments the fibers are crosslinked in the presence of the particle binder that comprises an α-hydroxy polycarboxylic acid and a polyol. Applicants submit the citation only states that the polycarboxylic acid (such as citric acid), polyols (such as propylene

glycol) and polyamines (such as ethylene diamine), *each independently,* can function as crosslinking agents and are consumed during the curing step to form covalent bonds. The '256 reference does not state that a *combination* of the polycarboxylic acid and a polyol are reacted in the curing step. Furthermore, even if they were, the '256 reference only teaches curing within the range of 140 °C to about 180 °C to prevent scorching and discoloration of the fibers, column 40, lines 62 – column 40, line 9.

Claim 38 recites providing a crosslinking material on fibers that have hydrogen bonding sites, curing at an elevated temperature to produce high bulk fibers that are internally crosslinked and leaving hydrogen bonding sites available on the cured fibers for hydrogen bonding. A binder is subsequently interposed between the fiber and added particles to provide hydrogen bonding. This claim only relates to forming an intrafiber crosslinked fiber and subsequently adding a binder and the particles. That is, a binder is added post curing the crosslinker.

Claim 44 recites adding a binder and crosslinking material prior to curing and then curing so that a sufficient portion of the functional groups of the binder remain capable of forming hydrogen and covalent bonds after curing. The particles are bound to the binder by hydrogen and coordinate covalent bonds and the binder is bound to the fibers by hydrogen bonds. Applicant submits that the claim must be interpreted in light of the specification. The specification teaches at column 40, lines 62 – column 41, line 7 that fibers are cured within a range of 140 °C to about 180 °C to prevent scorching and discoloration of the fibers. Thus one skilled in the art would not look to the '256 reference to crosslink cellulose fibers with a polycaboxylic acid crosslinking agent in the presence of a polyol and achieve a Whiteness Index of at least 69 and an L value greater than 94.5 after curing at 182 °C to about 215 °C.

The Examiner states that examples are given of fibers having a wet bulk of 16.1 cc/g or greater, column 29, lines 1-10. Applicant submits that neither the HBA nor the GHBA citation of 19.4 or 16.1 cc/g, respectively, relates to the instant invention in which cellulose is crosslinked with a crosslinking agent in the presence of a polyol in which a wet bulk of 16 cc/g is obtained. As noted in the '256 reference, column 28, lines 25- 28, HBA is a high bulk intrafiber crosslinked fiber that contains intrafiber covalent

crosslinks. GHBA refers to HBA fibers treated with a glycerin binder, column 28, line 29.

Applicants submit there is no motivation or suggestion in the Hansen et al. invention to arrive at the instant invention since, in the curing stage, Hansen et al. recite curing temperatures from 140 °C to about 180 °C and indicate that this range prevents scorching and discoloration and therefore a person skilled in the art would not be motivated to cure at higher temperatures because of the adverse effect on fiber color. Hansen et al. do not disclose all elements of the claims such as the Whiteness Index of greater than about 69, the L value greater than about 94.5 which is measured after curing at a temperature of from 182 °C to about 215 °C. Hansen et al. teach away from using curing temperatures greater than 180°C stating that these higher temperatures scorch and discolor the fibers. Furthermore the results of crosslinking of a polycarboxylic acid in the presence of a polyol give unexpected synergistic results in the Whiteness Index. Since Claim 1 is nonobvious under U.S.C. § 103 (a) then any claim depending therefrom is nonobvious. *In re Fine,* 837 F.2d 1071, 5 USPQ2d 1596 (Fed. Cir.1988). Withdrawal of the rejection is respectfully requested.

The Rejection Of Claim 8 Under 35 U.S.C. 103 (a)

Claim 8 is rejected under 35 U.S.C. §103(a) as being unpatentable over Hansen et al. ('256) in view of Smith et al. U.S. 2002/0090511.

Claim 8 is dependent on Claim1. Since Claim 1 is nonobvious under U.S.C. § 103 (a) then any claim depending therefrom is nonobvious.

Applicants submit there is no motivation or suggestion to combine the references to arrive at the claimed invention.

The Smith et al. invention relates to the use of refined cellulose fiber prior to crosslinking to achieve crosslinked fibers with low median desorption pressures and improved fluid drainage in acquisition and / or distribution layers compared to similar unrefined fibers, page 3 [0039]. The Smith et al. reference discloses refining the fibers to a freeness ranging from about 300 to about 700 CFS and then crosslinking the refined fibers. This action causes reduction in the average fiber length, [0054]. The fibers may be crosslinked in the presence of a reducing agent to

prevent yellowing of the fibers during the crosslinking reaction or they may be bleached during or after the crosslinking reaction to improve their appearance, [0068] and [0069]. Thus Smith et al. recognize the adverse effect of crosslinking and either prevent the yellowing by the addition of a reducing agent or treats the crosslinked fibers during or after curing to improve their appearance.

There is no motivation to combine the references. Smith teaches the crosslinking of refined fibers and the yellowing of the fibers during the crosslinking reaction. Smith et al. overcome this yellowing by either adding a reducing agent to prevent yellowing or by bleaching during or after the crosslinking reaction to improve their appearance. The list of crosslinking agents is extensive and includes malic acid. However, even if one would combine the references, all the elements of the combined claims would not be present. Smith et al. when combined with the '256 reference do not teach crosslinking of cellulose with a polycarboxylic acid crosslinking agent in the presence of a polyol, the amounts of polyol, the Whiteness Index greater than 69, measured after curing at 182 °C to about 215 °C, and *L* values greater than about 94.5.

When cellulose is crosslinked with citric acid, as shown in the Stoyanov Declaration submitted on October 9, 2006 the Whiteness Index is adversely affected. Thus the skilled artisan would expect similar results with malic acid and there would be no motivation to combine malic acid, which would be expected to adversely affect the Whiteness Index, with a polyol such as sorbitol which has been shown not to improve the Whiteness Index and arrive at the instant invention. Withdrawal of the rejection is respectfully requested.

The Rejection Of Claims 11-15 Under 35 U.S.C. 103 (a)

Claims 11-15 are rejected under 35 USC § 103(a) as unpatentable over Hansen et al. ('256) in view of Hansen et al. US 5,789,326, the '326 reference.

Claim 1 is an independent claim, Claims 11-15 are dependent from Claim 1.

For a *prima facie* rejection, there must be a suggestion, teaching or motivation, either in the references or in the knowledge generally available to modify a reference, there must be a reasonable expectation of success, and all the claim limitations must be taught or suggested in the prior art.

The disclosure of Hansen et al, ('256) has been addressed above.

Like the '256 disclosure, the '326 disclosure concerns polymeric and non-polymeric binders for fibers and the use of such binders in binding particles to fibers. In particular embodiments the invention concerns binding particles or superabsorbent particles to cellulosic fibers which may then be used, for example, to make absorbent fibers that are densified and incorporated into cellulosic products. Like the '256 patent the '326 patent also states that in the production of high bulk fibers, column 42, line 16 – column 45, line 21, the fibers are exposed to a curing temperature of about 140 °C to about 180 °C which is sufficient to effect curing of the crosslinking agent without scorching the dry fibers. The fibers are also not discolored from scorching and the like, column 45, lines 6-21.Thus the '326 patent also recognizes the adverse effect on color by curing above 180 °C and also teaches away from the higher curing temperatures of 182 °C to about 215 °C since this would discolor the fibers.

In one aspect the Hansen et al. reference (the '326 patent) describes a wet laid web of fibers having hydrogen bonding functionality and the binder molecules having at least one functional group capable of forming a hydrogen bond or coordinate covalent bond with particles and at least one functional group capable of forming a hydrogen bond with the fibers column 3, lines 13-23. In another aspect the patent also describes high bulk fibers with hydrogen bonding functionality and similar binder characteristics.

The Examiner states that the '326 reference discloses crosslinked cellulosic fibers comprising particle binders and cites the Abstract, column 10, lines 26-40 and column 45, lines 30-33. Applicant respectfully disagrees with the citation of the Abstract and the column 10 reference. The Abstract is silent as to crosslinked fibers and column 10, lines 26-40, are not crosslinked fibers but wood pulp fibers or softwood fibers, which can be chemical or chemithermomechanical or combinations thereof, lines 37-40. Thus, contrary to the Examiner's statement the first two references do not disclose crosslinked cellulosic fibers comprising particle binders. Furthermore, they do not refer to fibers crosslinked with a crosslinking agent in the presence of a polyol.

The disclosure of sorbitol as a particle binder in Claims 3 and 4 is only claimed in the context of being a non polymeric binder molecule which has at least one functional group capable of forming a hydrogen bond or a coordinate covalent

bond with particles and at least one functional group capable of forming a hydrogen bond with the fibers which are in a wet laid web, Claim 1. The '256 reference does not disclose the specific acycylic polyols and heterosides of the instant claims and the '326 reference only mentions sorbitol as a single binder in a group of binders consisting of glycerin, sorbitol, propylene glycol and carboxylic acids from which the binder may be selected.

The Examiner states that the crosslinking agent, such as citric acid, or any other crosslinking agent known in the art, can be added independently of the binder, column 42, line 61 to column 43, line 14 and particularly column 43, line 8. Applicant submits the specific reference does not state this and only states preferred crosslinking substances that are selected from a group consisting of urea derivatives and a specifically preferred crosslinking substance being DMDHEU. The reference states that crosslinking substances can be polycarboxylic acids such as citric acids.

It is within the overall context of forming high bulk fiber with intrafiber covalent crosslinks, column 42, line 16 – column 46, line 32, that Hansen et al. state in column 45, lines 67- column 46, line 2 that particle binders and particles can be added before, after, or simultaneously with curing. Curing in the presence of a binder is not usually a problem because the binder cannot participate in the intra fiber crosslinking reaction and the binder is not affected by the curing step. The '356 reference states that in certain situations the binder can function as a crosslinking agent and form covalent intrafiber crosslinks. *Polycarboxylic acids (such as citric), polyols (such as propylene glycol) and polyamines (such as* ethylene *diamine)* can function as crosslinking agents and are consumed during the curing step in the formation of covalent crosslinks, column 46, line 8-12. In the limited case in which the crosslinking agent is also a binder, steps should be taken to prevent the binder from being consumed as a crosslinker in the curing step thus maintaining its binding ability. Applicants submit that even in these situations where the binder may act as a crosslinking agent, since the reference teaches away from curing at temperatures greater than 180°C there is no motivation to combine the references and use 182 °C to about 215°C to cure and arrive at a Whiteness Index of the fibers, after curing, of the instant invention.

The '326 reference teaches that the particle binders may be added before, after or simultaneously with curing. In the context of Example 24 in which reference is made to Figure 3 for the crosslinking and curing, column 45, lines 31 and 32, this means that curing takes place at from 140 °C to about 180 °C which is sufficient to effect curing without scorching, lines 8 – 10 and 18, not at the curing temperature of from about from 182 °C to about 215 °C as in the instant invention, the curing temperature after which the Whiteness Index is measured.

The Examiner states that examples are given of fibers having a wet bulk of 16.1 cc/g or greater, column 29, lines 1-10. Applicant submits that neither the HBA nor the GHBA citation of 19.4 or 16.1 cc/g, respectively, relates to the instant invention in which cellulose is crosslinked with a crosslinking agent in the presence of a polyol in which a wet bulk of 16 cc/g is obtained. As noted in the '256 reference, column 28, lines 25- 28, and in the '326 reference, column 35, lines 36 -38, HBA is a high bulk intrafiber crosslinked fiber that contains intrafiber covalent crosslinks. GHBA refers to HBA fibers treated with a glycerin binder in the '256 reference, column 28, line 29 and in the '326 reference column 35, lines 38 - 41.

The Examiner states it would have been obvious to use sorbitol as a particle binder in the fibers of Hansen et al ('256) in view of Hansen et al. ('356) as a functionally equivalent option and have a reasonable expectation of success. It would also have been obvious to one skilled in the art that the other claimed species of polyol (erythritol, xylitol, arabinitol, ribitol, mannitol, perseitol, volemitol, myo-inositol and lactitol) having structures similar to sorbitol (five to seven hydroxyl groups on adjacent carbon atoms) would react similarly. Applicant disagrees. First erythritol has four hydroxyl groups and lactitol has twelve, see Attachment A, page 242 from "The Carbohydrates" by Ward Pigman, Academic Press, Copyright 1957 for the structure of erythritol and the Merck Index, page 5352 for the chemical and molecular formula for lactitol.

Applicant submits that there is no suggestion, teaching or motivation, to combine the references and arrive at the instant invention. Both Hansen references teach away from curing crosslinked fibers at temperatures higher than 180°C since this would result in scorching and discoloration of the crosslinked fibers thus color would be adversely affected. Applicants have shown that there is a synergistic unexpected result as

a consequence of crosslinking a polycarboxylic acid in the presence of a polyol to achieve a Whiteness Index after curing at 182 °C to about 215 °C of greater than 69. Furthermore, all the claim limitations are not taught including crosslinking a polycarboxylic acid in the presence of from about 1% to about 10% of the weight of the cellulose fiber of a C_4–C_{12} polyol and the Whiteness Index of greater than 69 of the crosslinked fibers measured after curing the fibers at 182 °C to about 215 °C. Withdrawal of the rejection is respectfully requested.

Double Patenting Rejection

Claims 1, 5-8 and 10-15 are provisionally rejected under the judicially created doctrine of obviousness-type double patenting as being unpatentable over (renumbered) claims 1-9 and 11-12 in copending Application No. 10/748977.

Claims 1, 5-8, 10-12 and 16 are provisionally rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-8 and 13 of copending Application No. 10/815206.

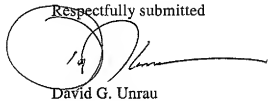
Claims 1, 3 - 8, 10, and 12-16 are rejected under the doctrine of obviousness-type double patenting as being unpatentable over Claims 1-11 of copending Application No. 10/748969.

Applicants note the double patenting rejection and will file a terminal disclaimer on the notification of allowable subject matter.

CONCLUSION

Based on the remarks, the Examiner is respectfully requested to withdraw the rejection of the claims and to promptly allow the case and allow it to issue. If the Examiner has any further questions, he is invited to call the Applicant's Agent at the number listed below.

Respectfully submitted



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